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## NEW SPECIES OF COLORADO APHIDIDÆ, WITH NOTES UPON THEIR LIFE-HABITS.

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In our study of Colorado Aphididæ during the past two or three years, we have endeavoured to trace each species throughout the entire year. In doing this work it has been necessary to make careful descriptions of the lice in all their stages of development. On account of inadequate descriptions of some of the described species, it is impossible in some cases to decide whether a louse under examination is a described species or not, and in other cases there seems to be very little doubt but that the species being studied is new to science. Some of the apparently new species I am describing below. If in any case an old species should be redescribed, I hope I shall give the description and the life-habits full enough in each case so that other workers may be able to tell upon what species I was working. Even this in some cases may not be an easy matter.

Unless otherwise stated, the descriptions are made in each case from fresh living specimens, and the colours given as they appear under a hand lens.

### *Aphis torticauda*, n. sp.

A large red louse on native thistles, *Carduus* sp. Light to dark red in general colour, with antennæ and cornicles black.

### *Apterous Viviparous Female* (Plate 11, figs. 1 and 4).

Described from specimens taken at Fort Collins, Colo., July 22, 1907.

Length, 3.5 to 3.75 mm; width, 2 to 2.20 mm.; antenna, 3 mm. Joints: III .9, IV .6, V .5, VI .14, VII .6 mm. Joint 3 with about 30 and joint 4 with 12 or more small circular sensoria. Joints 1 to 6 with a few short stout hairs on each. The antennæ are upon slight tubercles, and there is a small blunt tubercle on either lateral margin of the prothorax and each abdominal segment. The entire dorsum, including head, unicolorous-red; eyes, distal ends of femora, tibiæ, and all of tarsi, cornicles and antennæ black or blackish. Cornicles about .75 mm. long,

cylindrical, enlarging little or none toward base, and with distinct flange at apex. The cauda is very peculiar in form, is directed up and back, and is moderately broad at the base, but soon becomes small, tapering and crooked, appearing as if it had been twisted off. (Fig. 4.) Beneath the cauda the anal plate is protruded into a blunt point projecting back and ventrally, and appearing, often, more like the ordinary blunt conical cauda than does the real cauda. I have not seen a similar cauda in any other species. Beak long, much surpassing hind coxæ, the third joint long and slender.

*Winged Viviparous Female.*

Specimens taken by L. C. Bragg at Longmont on June 14, '07.

Differs little from the apterous form; the cauda is somewhat straighter and more symmetrical, wings rather stout, 4 mm. long, with subcostal nervure and stigma rusty-brown. Length of body about 3.4 mm., antenna much shorter, about 2.10 mm. Joints: III .61, IV .43, V .31, VI .14, VII .49 mm.; cornicles, .50 mm.

*Winged Male.*

Same date and place as the preceding females.

Colours as in the winged females. Length of body, 2.70 mm.; antenna, 2.40 mm.; cornicles, .54 mm. Antenna joints: III .65, IV .42, V .40, VI .13, VII .50 mm. Joints 3 and 4 strongly tuberculate, the former with about 40, and the latter with a single row of about ten small circular sensoria. Cornicles cylindrical, black. Cauda as in the alate female. Slight antennal tubercles.

*Apterous Oviparous Female.*

From specimens taken at Fort Collins, Oct. 27, '07.

Colour as in viviparous apterous form, except that the anal plates are conspicuously black.

Length, 2.5 mm. long by 1.35 mm. broad. Antenna, 1.8 mm. Joints: III .50, IV .36, V .30, VI .13, VII .43 mm. On joint 3 are a small number, about 15 to 25, circular, slightly tuberculate sensoria. The cauda is small, pointed, black, upturned, and does not show the peculiar twisted appearance as well as in the viviparous females. Beak reaches considerably beyond hind coxæ. Cornicles, .40 mm. Several specimens taken in copula. They are much smaller than the viviparous females. Oviparous females and males quite numerous, but I find no eggs yet. There are many ant attendants.

In nearly every colony I find a few very dark green oviparous females with reddish head and prothorax. I take them to be a colour variation only.

*Apterous Male* (Plate 11, fig. 7).

From specimens taken Oct. 26, '07.

General colour sordid yellowish-brown or greenish-rufous, with a pronounced tinge of rufous upon head and thorax, but without the bright red of the females. Antennæ, eyes, distal halves of femora and tibiæ, tarsi, cornicles, beak and anal plates black or blackish. Length of body, 1.75 mm.; length of antenna, 1.60 mm. Joints of antenna about as follows: III .36, IV .30, V .26, VI .11, VII .40 mm. Cornicles cylindrical, .17 mm. in length. Cauda very short, blunt and black. Third joint of antenna with about 20 small circular sensoria; joint 4 with about six, and joint 5 with about four. Joints with a few short stout setæ on each. Beak long, easily attaining hind coxæ.

This is the only plant louse that I have found having two sets of males. Those appearing in July did not continue long, and, being winged, had the semblance of very small females. No eggs were seen until after the appearance of the wingless fall brood of males during the latter part of September and October. This louse is always well attended by ants, and I have been unable to find eggs upon the food-plants in the field, but when the lice are brought into the laboratory and kept for a few days upon thistle, eggs are laid in considerable numbers. They are light green in colour at first, but become polished black in a few days. I cannot help wondering if the ants carry away the eggs.

On May 18 I found what seemed to be stem mothers of this species upon *Carduus* sp. at Akron, Colorado, and about each parent insect were a few light red young of different ages, and the thistles have been continually infested with the lice to the present writing, Oct. 20. We have not found this species infesting any other plant.

*Aphis carbocolor*, n. sp.

A black louse from stems and leaves of yellow dock, *Rumex*, sp.

*Alate Viviparous Female*, from Fort Collins, June 26, '07.

Black throughout, except for the greater part of the tibiæ and anterior femora, the proximal ends of the middle and posterior femora, and the long basal segment of the beak. The dorsal portion of the body is polished.

Body 1.9, wing 3, antennæ 1.3, cornicles .18 mm. Joints of antenna: III .34, IV .21, V .20, VI .11, VII .28 mm. Cornicles cylindrical, without marked thickening towards base, and without flange at distal end. Antennæ black, wing veins black, with 2nd fork of cubital vein rather short, stigma rather short and, along with subcostal vein, a little greenish in colour. Hind tibiæ 1.1 mm. long. Prothoracic tubercles rather stout and prominent, and usually the abdominal segments show well-developed lateral tubercles. Cauda short, black and upturned; 3rd joint of antenna with about eight moderately tuberculate sensoria.

*Apterous Viviparous Female* (Plate 11, Fig. 3), taken along with the alate form.

Deep, dull, sooty-black throughout, never polished; tibiæ, except distal ends, most of anterior femora, bases of middle and hind femora, third joint of antennæ and basal joint of beak, pale yellow or slightly dusky in colour. Body short and broad, almost globular, about 2.5 mm. long by 1.6 mm. broad. Length of antenna 1.3 mm., and the joints measure about as follows: III .40, IV .24, V .22, VI .11, and VII .24 mm. respectively. Cornicles .26 mm. long, without flange at tip, and somewhat broadened towards the base; cauda short and upturned. Tubercles of prothorax and abdomen as in the winged form. There is considerable variation in measurements of antennal joints, but joint 3 is longest, and joints 4 and 5 are about equal.

*Apterous Viviparous Female*. Taken Sept. 23, '07, at Ft. Collins, Colo.

Varies little from early summer form, but is a trifle smaller. Measurements vary little from: length, 2.10 mm.; width, 1.10 mm.; antenna 1.10 mm.; joints of antenna: III .26, IV .20, V .19, VI .11, VII .23 mm. Cornicles, .21 mm.

*Apterous Male* (Plate 11, fig. 5), taken at Ft. Collins, Colo., Oct. 6. 1907.

In colour like the females or a little lighter, the abdomen being a dark olive green when put into alcohol. Length of body, 1.30 mm.; antenna, .94 mm.; joints: III .22, IV .16, V .14, VI .10, VII .20 mm. Joint 3 with 8 to 10 oval sensoria of varying size, and joint 4 with about half as many. Joints distinctly crenulate, especially those beyond the 3rd. Cornicles, .11 mm.

*Apterous Oviparous Female*, taken along with the males above.

Very similar to viviparous form, but a little smaller, about 1.9 mm. long; antenna barely 1 mm. Depositing yellowish-brown eggs about bases of dock stems. The eggs soon become polished black.

A very common species, and nearly all adults are getting wings now. The pupæ have very dark brown abdomens, and the thorax is dark green. The shorter cornicles dull black colour, and shorter 6th and longer 7th joints of the antenna are characters separating this species from *Aphis medicaginis*, with its shining black apterous females, and which infests a large variety of plants.

This was a very abundant louse upon the stems and leaves of *Rumex* during the month of June and the early part of July, 1907. By the last of July the enemies of this louse had so reduced its numbers that Mr. L. C. Bragg, who was making constant field observations for me, was able with difficulty to find specimens through the month of August, and then they were found close to the ground. By the first of October they had become quite abundant, but to the casual observer would be unnoticed, as they remained close to, or even somewhat beneath the surface of the ground. At this writing, Oct. 20, the males and oviparous females are very abundant, as are their eggs, upon the bases of the leaves and dead seed stalks. Winged females were abundant during June and July, but have been entirely absent since about the last of September.

So far as Mr. Bragg or I have been able to observe, this louse confines its attacks to the genus *Rumex*.

*Drepanosiphum Braggii*, n. sp.

I take pleasure in dedicating this interesting new species to Mr. L. C. Bragg, who is a most careful and enthusiastic student of nature, and who first discovered this species upon box elder at Fort Collins, in the summer of 1906.

*Alate Viviparous Female.*

Described from specimens taken at Fort Collins, Oct. 18, '07.

General colour of head, prothorax and abdomen pale greenish-yellow; of mesothorax pale yellowish-brown; eyes bright red, cornicles concolorous with the abdomen at base, rusty-brown in distal half, and may be black at extreme tips; antenna pale yellowish-brown, with distal ends of joints 3, 4, 5 and all of joint 6 black; tibiæ entirely dusky, tarsi blackish, femora all concolorous with abdomen. Antenna very long, filiform, a little more than twice the length of the body, 7th joint, if whole, the longest.

Length of body 3, wing 4.6, antenna 6.3 mm. Joints of antenna about as follows: III 1.5, IV 1.4, V 1.2, VI .22, VII 1.8 mm. Third joint with a single row of about 7 to 10 sensoria on the under side of the

basal half. The sensoria are rather small, transverse and not much tuberculate, and the sixth joint tapers gradually into the seventh. Frontal tubercles for antennæ large, vertex hardly convex, prothorax rather long and rectangular in form, and without lateral tubercles; cornicles .66 mm. long, cylindrical and somewhat constricted near distal end. Terminal joints of abdomen prolonged into a sort of short ovipositor (for depositing young). Cauda short, conical, upturned; beak barely attaining 3rd coxæ: length of hind tibiæ 2.6 mm.

These winged females are fairly common yet among oviparous females and young upon the under side of leaves of box elder on college campus. A very active louse with long legs, and it often jumps from the leaves when disturbed.

There seems to be no apterous viviparous form in this species.

*Apterous Oviparous Female* (Plate 11, fig. 6).

Described from specimens taken at Fort Collins, Oct. 18, '07, from the box elder.

In general colour varying from very light greenish-yellow to a sordid or even dusky yellow, becoming darker with age. Antenna very pale yellow, annulated with black as in winged form; colour of legs and cornicles and eyes as in winged form. The body of this egg-laying female is very peculiar in having an extremely elongated ovipositor-like end to the abdomen. The distance from the cornicles to the tip of the abdomen is nearly one and one-half mm., or more than one-third the entire length of the body. Length of body, 3.8 mm.; length of antenna 5.55 mm.; joints: III 1.2, IV 1.14, V 1.11, VI .20, VII 1.71 mm. Length of hind tibiæ 2.22 mm. Cornicles cylindrical, gently curved, enlarged slightly towards the base, and 6.5 mm. in length. Prothorax without tubercles; body set with scattering hairs; joints of antenna with a few minute hairs upon each segment. The cauda is small, broad and upturned, and quite inconspicuous. These females have fully-developed ova at this time, and are present in considerable numbers on the under side of the leaves of box-elder trees upon the college campus. I find them most common upon small twigs near the trunk and upon small shoots thrown out about the trunks.

*Winged Male* (Plate 11, fig. 8).

Specimens taken along with above described females.

General colour very light green or greenish-yellow, with or without a tinge of brown on head and thorax, and a deeper brown on more or less of cornicles. Upon the dorsum of the abdomen are two to four black

blotches in the region of the cornicles, and the antennæ are black to near the base of joint 3. Other dark parts as in alate female.

Length of body, 2 mm.; antenna, 5.2 mm. Joints of antenna as follows, with small variations: III 1, IV 1, V. 1, VI .17, VII 1.75 mm. Fully two and one-half times the length of the body. I think this is the longest antenna for length of body I have ever seen among the Aphididæ. Vertex barely convex between the frontal tubercles. Joint 3 with a very large number (probably as many as 100) small transverse sensoria occurring upon all sides, joint 4 with about half as many, and joint 5 with 20 or more, all upon one side. The young lice have capitate hairs.

Except for the long cornicles, this species seems a close relative of *Drepanosiphum acerifolii*, and it has the same general habits. The males are specially given to jumping when disturbed, and the strange-appearing oviparous females use their long drawn-out abdomen, which is suggestive of an elephant's proboscis, with which to feel around in the crevices of the bark of the trunk and large limbs for suitable places in which to deposit their pale yellow eggs, which are placed singly or in small clusters. The stem mothers in the spring also acquire wings as in case of *acerifolii*.

Egg laying begins about the first of October.

The box elder seems to be the only food-plant for this species, and it continues upon this food-plant throughout the season.

*Callipterus robinia*, n. sp.

From leaves of black locust, *Robinia pseudacacia*.

*Winged Viviparous Female.*

Described from specimens taken in Denver, Colorado, Sept. 3, 1907.

A pale lemon-yellow or greenish-yellow louse, with red eyes. Distal ends of joints 3 to 7 of the antenna, tarsi, extreme apex of short beak and a spot near distal end of hind femora black, and a dusky spot in stigma of wing. No other dark markings.

Length of body 1.6 to 1.8 mm. Length of antenna 1.6 mm., or barely attaining tip of abdomen, and without hairs. Joints: III .60, IV .38, V .34, VI .14, VII .07 mm. Sensoria rather large, transversely oval, closely placed, and about ten in number on basal one-half of joint 3. One large sensorium near the end of joints 5 and 6. Abdomen smooth except for a lateral row of small tubercles on either side. Subcostal vein of fore wing moderately bent forward at base of stigma, second transverse nerve moderately sinuate, nervures dusky-brown, costal nerve of hind wing sharply bent downward to meet second transverse nerve, the transverse nerves nearly straight; cornicles tuberculate, swollen at base, prominent; cauda knobbed. Head and prothorax broad, the latter without tubercles, middle ocellus prominent.

A white line beginning at base of each antenna extends over the dorsum of the head and thorax, and is continued over all segments of the abdomen as a powdery white spot upon each segment. There is also a broken line along either lateral margin, beginning back of each compound eye, and appearing as white spots on the abdominal segments to and including the 5th.

*Oviparous Female.*

Specimens taken at Denver, Colo., Oct. 12, '07.

General colour pale green, the dorsal surface of thorax and abdomen covered with numerous dusky spots and transverse dashes, each of the dusky spots giving rise to a capitate hair.

Length of body, 1.9 mm.; length of antenna, .95 mm. Antenna joints: III .36, IV .20, V .14, VI .11, VII .06 mm. Antenna dusky-brown to blackish in colour, with joints 1, 2 and 3 lighter. Legs dusky-brown; cornicles short, tuberculate, not longer than broad; cauda very small and upturned. Segments 6, 7 and 8 of abdomen much prolonged. No sensoria on any of the segments. Eyes red, or gray with red centres.

*Winged Male.*

Taken from black locust at Denver, Colo., Oct 12, '07.

General colour light green, with head, middle of pronotum, lobes of mesothorax, scutellum, transverse dash on the hind margin of metathorax, abdominal segments 1 to 6 inclusive, and transverse bands on segments 7 and 8 black. In some examples these black dashes do not show on all of the segments. The tip of the abdomen, the antennæ, distal portions of the femora, tarsi, pleura of mesothorax, and the mesosternum are also black or dusky in colour. Eyes light red at centre, but gray about the margins.

Length of body, 1.50 mm.; length of antenna 1.11 mm. to 1.6 mm.; length of wing 2 to 2.40 mm. The veins of the wing slightly dusky. Cornicles very short, tuberculate, not longer than broad. Joints of antenna: III .60, IV .34, V .30, VI .16, VII .09 mm., with considerable variation in different specimens. Joint 3 has a single row of about 15 to 20 transverse sensoria upon the under side. Joint 4 about six, and joint 5 about five, and joint 6 with three similar sensoria. Abdominal segments 1 to 5 are tuberculate upon lateral margins.

The white lines and spots described for the viviparous female are also traceable to a greater or less extent upon the male, and are usually quite distinct upon head and thorax. The black dashes on segments 3 to 6 of the abdomen may be indistinct, missing, or in spots only.